PALOMAR AMATEUR RADIO CLUB

October 2020 SCOPE Newsletter

October General Meeting

Auction

This is October when we usually hold our auction, and 2020 may have thrown wrenches this way and that, but we are still having our Auction! Please join us at the usual Zoom link (listed below) on Wednesday, October 7th, 2020 at 19:30 Pacific for our annual auction! The Zoom session will open at 19:00 for pre-meeting rag-chew and auction preview (which is also available to preview here).

Logistics:
Payment for all items is to be done via PAYPAL (or the button below) to paymaster@palomararc.org at the close of the auction.
Sellers will be paid by check from the club once all accounts are settled (within 30 days of the auction)
Item swap location: 3209 Harding St, Carlsbad, CA 92008
We will be in the parking lot at our normal meeting location, the Pine Ave Community Center in Carlsbad.
SELLERS Drop off items on Saturday morning, October 10th, 2020 between 10:00 and 12:00
BUYERS Pick up items Saturday, October 10th, 2020 between 12:00 Noon and 14:00 Pacific Time
NOTICE: Items not picked up are considered forfeit and may be resold by the club!
If you are unable to make the meet time/location please don't bid. If something comes up

later and you are unable to make it, please advise the Board ASAP to see if other arrangements are possible.

Join us on Zoom to participate in social time starting at 19:00
https://zoom.us/j/3391648905

Upcoming Events

Amazon Prime Day

You can make a difference while you shop Amazon Prime Day deals on October 13 & 14. Simply shop at smile.amazon.com/ch/95-3737299 or with AmazonSmile ON in the Amazon Shopping app and AmazonSmile donates to Palomar Amateur Radio Club Inc.

November General Meeting

The Science of Sound

Dr. Bob Heil from Heil Sound
November 4th, 2020 at 19:30 Pacific

Company founder Bob Heil understood very early in his career as a microphone designer that voice articulation is key to ham radio, both for emergency use as well as for the hobbyist. His ham radio products are a result of that level of concern for the voice. Bob is a legend in amateur radio, an author, and "in demand" speaker at ham events around the world. His weekly "Ham Nation" show can be seen on Twit.tv network.

Chair Reports

Membership Report

Please keep an eye on your email for direct updates from your Membership Chair, Glen AI6RR, for updates about your individual membership status and renewal dates. You can always reach out to him directly or Check Your Membership on the website.

Financial Report

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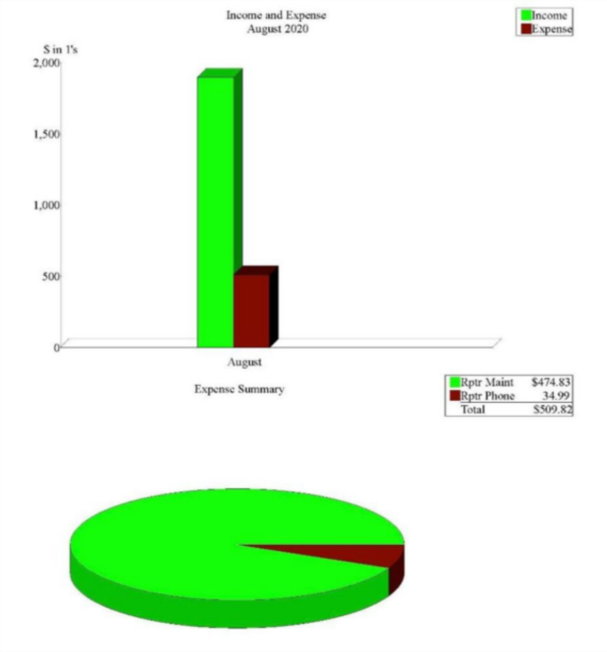
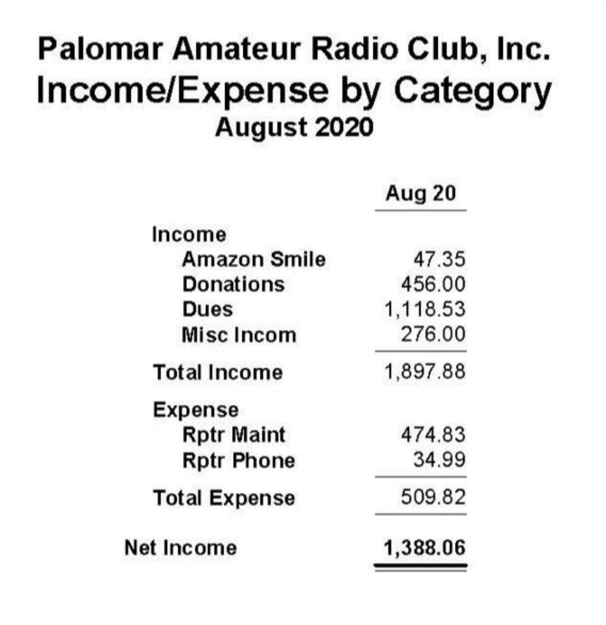
amazonsmile





Palomar Amateur Radio Club, Inc.
Income/Expense by Category
August 2020

	Aug 20
Income	
Amazon Smile	47.35
Donations	456.00
Dues	1,118.53
Misc Incom	276.00
Total Income	1,897.88
Expense	
Rptr Maint	474.83
Rptr Phone	34.99
Total Expense	509.82
Net Income	**1,388.06**

Articles

Recording of this presentation available here:

https://www.youtube.com/watch?v=H-XssWeETAw

Hello. My name is Michelle Thompson W5NYV. And I'm an engineer!

It has not been an easy career to be an engineer, but it has been extremely eventful and deeply rewarding. I'm a senior member of IEEE and served in the IEEE Distinguished Visitor Program in the areas of open source amateur radio satellite service and algorithmic music composition. I'm a life member of AMSAT, ARRL, 10-10 International, and I managed to renew my TAPR membership just in time for this talk. I just retired as chair of GNU Radio Conference. I founded the San Diego Chapter of IEEE Information Theory Society, serve as a telecommunications executive for a company providing rural broadband and voice telephony services in Mississippi, and am full of gratitude for my eternally supportive and completely understanding family in San Diego, CA.

A couple of years ago, I co-founded Open Research Institute, a 501(c)(3) dedicated to open source research and development in amateur radio and beyond. I'm currently the CEO.

I can't think of doing anything other than engineering. It's more of an identity than a job. I could be hired to do other types of work, but I would still approach it like an engineer.

I'm a vocational engineer because of amateur radio. Without amateur radio growing up, without being allowed to play radio, I would not have found my calling. I would not have been able to contribute to the economy as an engineer. I would not have had the opportunities.

The technical part of engineering is not the hard part. It's not even the most important part of solving problems. Without being exposed to the fundamentally decent, generous, and thoroughly civil spirit of amateur radio, I would simply be helping companies and myself make more money by whatever means necessary. I would have been less patient, more judgmental, and much thinner-skinned.

But, that is not how I ended up. Amateur radio invites us to answer (or ask) "why" instead of just figuring out "how" to do something technical. Just the fact that we are expected to follow the rules when literally no one, except ourselves, is watching? That's a huge positive influence on an individual. That is rare, especially now, when a commercial, proprietary, and entertainment-centered mindset is so dominant.

I am a third generation ham and my son is a fourth generation ham. Comparing our experiences, and where we go from here, is part of what I am talking about tonight.

What I was able to do in radio growing up, I'm not able to easily do now. What my son is doing in amateur radio right now, is very different from I used to think of as the typical or true entry point to ham radio.

What beginners like my son tend to do now is no longer HF centric, like it was for me, but is increasingly microwave, or appliance operation on VHF/UHF, frequently with a public service aspect.

I built a crystal radio kit and learned to solder in the garage. I got a code practice oscillator as a gift from my dad and it meant the world to me. I failed repeatedly to make him proud by totally stinking at learning code, but the thing is, he made me a circuit. A useful, handmade, totally awesome, customized thing, just for me. And I knew I could use those skills on the air. That built confidence.

Being made to feel responsible for my behavior on the air made me take ownership of not just a bit of spectrum, but other things. Like, littering is stupid.

And, breaking the rules while driving is wrong, even when you won't get caught. You could say amateur radio had a knock-on effect that a lot of the other parenting and repercussions at school never really did. I was being entrusted with something big, something special. I had to take care of it and show some respect.

So what did I make for my son? We bought a Raspberry Pi. I made him install and configure Ubuntu. This was now a proper server. Different than his iPad or desktop computer. I taught him how to find useful programs on GitHub. We installed everything it took to use a cheap software defined radio receiver called an RTL-SDR, which connected to the Raspberry Pi over USB.

We installed GQRX on the Raspberry Pi, then we installed dump1090. Within about an hour we were looking at an animated map of all the aircraft coming and going from San Diego that were transmitting their telemetry on 1090 MHz, the ADS-B channel. Far out to sea, far inland over the mountains, down into Mexico, way up north. Then, we made it possible for anyone in the house to see the same map, just using a browser on their computer, simply pointed at the right port on the Raspberry Pi up in my son's room.

This is just the tip of the iceberg with what you can do. In another 30 minutes were were listening the entire 2m band and using signal identification software to figure out the statistical differences in the transmissions. I taught him about the theory of transmitter fingerprinting. He found it completely unremarkable that you could monitor the entire band, all at once, and have a computer program watch for things that the human ear or eye simply cannot hear or see.

And then, because he has a license, and isn't restricted to just listening, we got his new Raspberry Pi "rig", that cost less than $100, to work with a software defined transceiver called a PLUTO, from Analog Devices, which I had leftover from a conference giveaway, and he made a few calls on VHF.

Now, software defined radios don't have much output power, and no one called back. But he was now figuring out that he had an entire universe of radios a few clicks away for less than it costs to buy a good hand microphone.

It's not all good news. Next, we tried to download NASA core flight system, so we could send fake telemetry back and forth across the house to each other. We wanted to try and take control of each other's pretend spacecraft in something like a duel. This didn't get very far because open source doesn't mean that it always works. Open source doesn't mean it always works well. Just because it's open source doesn't mean you have the time to fix a program that doesn't work, even though you have all the source code right there in front of you.

So what was the problem? NASA core flight systems was in a state where it couldn't install on a Raspberry Pi. The issue was clearly documented, and if we had a couple of days free, maybe we could have fixed it ourselves. Open source isn't magical pixie dust, and my strong advocacy of it will always acknowledge the weaknesses of publishing things as they are created. The author may not be finished. The author may not share your views on what constitutes finished.

A lot of open source authors get their project up to the point where it worked for them, on their hardware, for their needs. That point may not be where it needs to be to work for you. The big difference between proprietary closed source code, and open source code, is that you have the freedom to adapt and modify. There is no guarantee that you will have the time or energy to adapt and modify, but anyone can download, read, and improve what has been written and published.

This is why open source communities are so very important, and why it is so important that we teach each other how to better collaborate to make open source amateur radio work high quality, accessible, and as easy to use as possible.

What you or I are good at, and what we can contribute, can be reviewed, critiqued, and changed by others. Over time, this makes for measurably better code than proprietary designs.

Every year, Coverity, a Synopsys company, scans large quantities of code and evaluates it for defects. Starting in 2014, results from this study started showing a trend.

Quote: "The report details the analysis of 750 million lines of open source software code through the Coverity Scan service and commercial usage of the Coverity Development Testing Platform, the largest sample size that the report has studied to date. A few key points: Open source code quality surpasses proprietary code quality in C/C++ projects. Linux continues to be a benchmark for open source quality. C/C++ developers fixed more high-impact defects. Analysis found that developers contributing to open source Java projects are not fixing as many high-impact defects as developers contributing to open source C/ C++ projects." End Quote.

Open source isn't just for the feels.

So, my son's experience starting out in amateur radio was microwave, digital, inexpensive, and required some amount of computer expertise to take advantage of a vast open source codebase for radio work.

He doesn't code. He doesn't have to, in order to have almost any type of microwave band radio for the cost of some clicks and dealing with installation and configuration of a software defined radio.

Despite nagging him for over a year, he is completely uninterested in upgrading his license and would only join ARRL if I bought him a membership.

To see this as a trend, we can look at ARRL statistics. New licensees really are not upgrading like they used to. My anecdote is not isolated or unusual. ARRL is very concerned about this, because not only do the new licensees not upgrade, these new Technician class hams don't join ARRL at the same rates. The numbers presented at the ARRL forum at HamCation in February of 2020, which was, as we all know, about 19 COVID years ago, show some clear trends. The interpretation by some at that forum was that people were getting their licenses, failing to get started, not getting on the air, and giving up. The problem to ARRL was that they weren't active. If they would only upgrade to General, and see the magic of HF, they would get on board, get active, join ARRL, contribute to spectrum defense, and be happier hams.

ARRL is heavily invested in the incentive licensing path. The incentive is HF. The lack of HF operating really was perceived as a lack of operating in general. I don't think this is true from what I see locally, what I hear from teachers, and what I see at Open Research Institute.

Two things are factors here. First, band conditions haven't been great for HF for a while, and that could be a reason to postpone upgrading. And, the communications boom at microwave, UHF, and VHF. All of the things that my son has found really fun.

Why upgrade when Technician gives you all the privileges you need on the best bands doing the coolest things? Maybe, the incentive behind incentive licensing has changed.

We are in the middle of an enormous tide of availability. We have access to inexpensive powerful electronics components of all types. We have obscene wealth in computing, coding, machine learning, accessible computer languages, and free and powerful digital signal processing frameworks like GNU Radio. We see prices dropping rapidly on microwave parts because of the global scale of cellular sales as systems move towards 5G, as car radar systems become ubiquitous, and as the internet of things washes into almost every niche of every sensor market.

Some of this will of course wash back out. Not every device needs to be connected. Things like medical wearables and energy harvesting have yet to hit a sweet spot. There are products and services that will fail.

But, the internet of things means that RF-enabled devices are ordered by the millions, and we can clearly see the benefits in what we can buy from Adafruit, Mouser, Alibaba, Amazon, Ebay, and Digikey. Today, you can order an inexpensive 10 GHz doppler radar system for a few dollars, and then use it for all sorts of really fun ranging, communications, and art. I can have a pretty good LNA for $20 in my mailbox tomorrow. I can order a pack of low loss SMA cables, or the tools to make them, for less than I paid for a single SMA cable only a few years ago.

I can have an entire open source 122 GHz transceiver from VK3CV assembled for me and have it up and running in no time.

I can put together a remote monitoring station for 10 GHz amateur microwave band with an RTL-SDR, a Raspberry Pi, a satellite TV LNB, and use a WiFi dongle as a backhaul. Or put in a cellular module, if I want to make it really remote.

I can take either one of these designs and make it better if I want, because everything that I need to recreate the hardware has been published. And that is absolutely key. Open source work, where designs are is freely shared, is not only in the true amateur spirit for high-tech terrestrial amateur radio, but it is absolutely essential to the survival of the amateur radio satellite service moving forward. And, I have some very, very good news here.

I mentioned that I co-founded a non-profit for open source R&D for amateur radio. We haven't just been publishing technical work for microwave broadband digital systems. We also took regulatory action concerning the International Traffic in Arms Regulations, known by the acronym ITAR. These regulations have been a huge impediment for amateur satellite work since the 1980s because communications satellites are regulated under ITAR and also EAR, the Export Administration Regulations.

Fear, uncertainty, and doubt about the regulations, the severe penalties for getting them wrong, the costs of compliance, and the fact that there is no way, for example, for a volunteer AMSAT team to pre-certify as ok under ITAR, all of these things have created a situation where it's extremely difficult to get anything done. It's definitely not fun to be afraid that you're going to run afoul of ITAR while building something that you don't get a second chance to fix, if something goes wrong after it's launched.

On 20 February 2020, Open Research Institute filed a Commodity Jurisdiction Request with the US State Department, seeking to establish that key technologies for amateur radio are not subject to State Department jurisdiction. "Information and Software for a Digital Microwave Broadband Communications System for Space and Terrestrial Amateur Radio Use" was assigned the case number CJ0003120. On 11 August 2020, the case received a successful final determination: the technology is not subject to State Department jurisdiction.

This is the best possible outcome of a CJ request. We made a case for open source amateur radio satellite service designs, both hardware and software, being free of ITAR, and the government agreed.

The Final Determination letter, Commodity Jurisdiction cover letter, and the application itself can be found at:

https://github.com/phase4ground/documents/tree/master/Regulatory

The summary of the Commodity Jurisdiction request will eventually be published by the State Department at:

https://www.pmddtc.state.gov/?id=ddtc_kb_article_page&sys_id=6ea6afdcdbc36300529d368d7c96194b

Under this determination, the technologies are subject to the EAR. The next step is to submit a classification request to the Commerce Department. Open Research Institute anticipates that the Commerce Department will find that these technologies are unrestricted under the carve-out for open source in the EAR. This step is underway. The step after that is an Advisory Opinion request. This request will ask that openly published work ceases to be subject to the EAR. This establishes a full chain of documentation for open source amateur radio satellite service work.

The legal costs were reimbursed by ARDC, the Amateur Radio Digital Communications Foundation. ARDC raised many millions of dollars by selling part of the IPv4 block assigned to amateur radio, to Amazon.

ARDC and Open Research Institute share a vision of clearly establishing open source as the best and safest way to accomplish technical volunteer work in amateur radio. This final determination letter provides solid support for that vision. The determination allows free and open international collaboration for amateur satellite work. The path is clear for so many wonderful projects facilitating new methods for terrestrial and satellite communications.

So, we have a situation where microwave electronics are pre-eminent, powerful, and as inexpensive as they have ever been, and are a common entry point for new hams.

We have a situation where the regulatory path for open source designs for terrestrial and space have been determined to be free of ITAR.

What now?
Well how about some funding?

I have some very good news here too.

After over a year of work, multiple reviews and re-writes, public workshops, forum presentations, and valuable feedback, Open Research Institute received three major grants this summer totaling nearly $600,000. The grants were awarded in order to design and build a microwave digital multi-user broadband system for space and terrestrial use. We refer to this as a “Ground Station” project, but this does include a microwave-band regenerative multiplexing transponder. That is the part that would go into space as a payload, or be placed as a central node for terrestrial deployment. We are actively working launch opportunities. Since this is a regenerative payload, there are some benefits over a bent pipe system like QO-100. This is designed specifically for amateur radio. It is not an adaptation from a commercial product.

https://www.ampr.org/grants/grant-open-research-institute-p4xt-phase-2/

Above is a link to the overview and project proposal.

https://openresearch.institute/2020/08/14/p4xt-phase-one-workshop- design-review/

Above is the most recent design review workshop.

So who provided this money?

Yasme Foundation, ARRL Foundation, and ARDC Foundation all generously supported this proposal and have provided support, guidance, encouragement, and feedback. Engineering work is well underway and is open to all, anywhere, who want to contribute and learn. You do not have to be an expert to join. You just have to be willing to become more of one along the way.

Read our “getting started” page here:

https://openresearch.institute/getting-started/

Open Research Institute does not sell memberships. We do not compete with membership societies or clubs. We are not a replacement for membership societies. We are a research institute that sponsors and supports projects. People join Open Research Institute projects by showing up and contributing. We have a Code of Conduct, Developer and Participant policies, and a written process for resolving complaints.

Part of the funding we have received will be used to set up two amateur radio labs. These will be accessible for remote work and will have volunteers staffing them to make it as easy as possible for the community to get more done. Work that cannot be done remotely simply requires some communication and a test plan.

Open Research Institute has a full floating Xilinx Vivado license available right now for open source field programmable gate array work. As many of you know, this license is not priced for hobbyists or amateurs. If you or someone you know could use a full Vivado License for open source amateur radio work, then get in touch. All you need to do is a simple setup through GitHub, and then the license is remotely accessible.

And that’s just the beginning of what we have planned, and what we are capable of as a community. In order to bring more projects to the table, it is time to spread the word about the dramatically increased funding available for open source amateur radio work.

Do you know of a project or organization in amateur radio, that is doing or could be doing open source work, and deserves some funding? Do you have an idea that would help the hobby, but you haven’t gotten around to doing anything about it because you’d need some test equipment? Do you see an opportunity to build something that would bring joy to hams? Do you know of any deserving citizen science investigations? Amateur radio in education is a very high priority for ARDC. How about curriculum development for modern amateur microwave theory and practice? What could ATN do?

ARDC wants to hear from us, in the microwave community. ARDC wants microwave enthusiasts to apply for grants.

Open Research Institute can help here too. Foundations like ARDC give money to 501(c)(3) organizations. They are not able to make grants to individuals. Open Research Institute can make it easy for deserving people, projects, and organizations to receive money. An organization like Open Research Institute sponsors the project, the project agrees to the Developer and Participant policies and the Code of Conduct, and the project gets a dedicated bank account for disbursement of the funds. SBMS as a 501(c)(3) can do this too.

As a community, we have a huge improvement in the regulatory framework that will make a big difference moving forward. It means that free and open international collaboration between amateur satellite groups can be restored, today.

As a community, what we do is the best place to be amateur radio. A very common point of entry in amateur radio right now consists of cheap software defined radios and simple single-board computers like the Raspberry Pi. This is an excellent fit for microwave activity, operations, experimentation, and learning. Amateur radio inspires new generations of engineers and scientists. The public service values and self-policing aspects reinforce positive cultural values. We owe it to the future to keep this going.

As a community, we have an enormous increase in the amount of money available for open source amateur radio work. The influx of ARDC money can galvanize the amateur ecosystem. There is potential for enormous positive, and yes, disruptive, change. So far, the money has provided much needed financial support for scholarships, hardware innovations, critical software maintenance, classroom content, and amateur radio infrastructure.

What does all this mean? There has never been a better time to be in amateur radio, and we need to step up.

I cannot think of a better organization to take full advantage of this truly amazing time opening up in front of us than the San Bernardino Microwave Society. This is a great group of accomplished, generous, and interesting people that have consistently provided encouragement, solutions, and excellent advice to me and my friends in San Diego for years and years. There simply would not be a microwave hobby in Southern California without this group.

If Open Research Institute is going to be successful with our digital microwave payload design, we will undoubtedly need help from the members of SBMS. We have already directly benefited from SBMS members that have showed up, shared their expertise, supported our work, and given invaluable feedback so that what we do is better, relevant, and lasting. I am looking forward to many more years of happy collaboration and a big increase in opportunities for technical volunteers in amateur radio space and terrestrial R&D. Seeing regulatory and funding barriers fall like they have over this past summer fills me with optimism and enthusiasm.

Thank you for welcoming me to speak about what I’m excited about in open source amateur radio. I’m here to answer questions. If you think of a question later, please write me at w5nyv@arrl.net.

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NN3V	Charlie	Vice-President
WB6IQS	John	Secretary
W0NI	Tom	Treasurer
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Member Satisfaction Survey

Scope Articles/Content

Please submit articles or content to scope@palomararc.org if you have done something interesting please share with us! We'd love to see your HAM shacks, mobile rigs, hiking rigs, stories about your hikes or expeditions, anything you think other club members may be interested in reading about.

Donate

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